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Behavior-Analytic Approaches to Working With People With Intellectual and Developmental Disabilities Who Develop Dementia: A Review of the Literature

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Abstract

Behavior analysis has made contributions in the development of evidence-based interventions for people with intellectual and developmental disabilities (IDD), and there is a growing evidence base for behavior-analytic interventions for older adults with dementia. As there is an increased number of adults with IDD living to old age, and an increased prevalence of comorbid dementia in people with IDD, a review of the behavior-analytic contributions with this population is warranted. Web of Science and PsycInfo were manually reviewed for the last 20 years for five behavioral journals. Six behavior-analytic studies with people with IDD and dementia were identified, and all but one were published outside of core behavior-analytic journals. These articles were analyzed in terms of Baer, Wolf, and Risley's (1968) seven dimensions of applied behavior analysis (ABA). The possible explanations and implications of these findings are discussed with consideration of the unique features of a comorbid diagnosis of IDD and dementia that may make it appropriate for increased focus in behavior-analytic research and practice.

Keywords: aging, applied behavior analysis, comorbidity, dementia, intellectual disability

Behavior-Analytic Approaches to Working With People With Intellectual and Developmental Disabilities Who Develop Dementia: A Review of the Literature

In recent years, the expected life-span of people with intellectual and developmental disabilities (IDD) has increased significantly (Janicki & Dalton, 2000). For example, the life expectancy for someone with Down syndrome was 25 years old in the 1980s (Yang, Rasmussen, & Friedman, 2002), whereas people with Down syndrome can now be expected to live to 60 years and beyond (Glasson et al., 2002). Although the mean life expectancy of people with other IDDs is varied (e.g., between 50 and 60 years for people with Williams syndrome and between 80 and 90 for people with fragile X syndrome), life expectancies now approximate those of people without IDDs (Coppus, 2013). The increase in life-span is likely a result of improved health care, better awareness of medical conditions, and deinstitutionalization. However, the increased life-span raises concerns for care and service provision, particularly because the prevalence of dementia in people with IDD is estimated to be much higher than in the general population.

Dementia (now called major neurocognitive disorder in the *Diagnostic and Statistical Manual of Mental Disorders*, 5th ed.; American Psychiatric Association, 2013) describes a progressive deterioration in a range of skills such as verbal behavior, social skills, and remembering. The term refers to a range of underlying causes of neurological change (e.g., Alzheimer's disease, vascular dementia). Visser, Aldenkamp, van Huffelen, and Kuilman (1997) showed that in a sample of people with Down syndrome, 77% aged 60–69 years and 100% aged over 70 had dementia. Similarly, Strydom, Chan, King, Hassiotis, and Livingston (2013) found that the prevalence of dementia in people with IDD was five times higher than general population estimates. Prevalence estimates in the general population are that 1%–2% of people aged 60–69 years will be diagnosed with dementia, with prevalence doubling in each 5-year age increment to prevalence of 20%–30% of people aged 84 years and over

(Ferri et al., 2006). Additionally, people with IDD are likely to develop dementia at younger ages than the general population. The prevalence of early onset dementia (people aged 20–64 years) is predicted to be approximately 42 in 100,000, or less than 1% of the general population (e.g., Ikejima et al., 2009). By contrast, estimations of the prevalence of young-onset dementia in people with IDD are up to 20% (Royal College of Psychiatrists, 2015). The increased risk for developing dementia is also observed in the wider population of people with other intellectual disabilities, even controlling for the increased risk associated with Down syndrome (Cooper, 1997).

Behavioral gerontology was defined by Burgio and Burgio (1986, p. 321) as "the study of how antecedent and consequent environmental events interact with the aging organism to produce behavior." Behavioral gerontology research to date has demonstrated that the science of behavior analysis and many of the methods previously established for use with people with IDD can also be effective for people with dementia. The methods supported by evidence include preference assessments (e.g., Feliciano, Steers, Elite-Marcandonatou, McLane, & Areán, 2009; LeBlanc, Raetz, Baker, Strobel, & Feeney, 2008; Raetz, LeBlanc, Baker, & Hilton, 2013) and functional analyses (e.g., Baker, Hanley, & Mathews, 2006; Buchanan & Fisher, 2002). Because of the distinct evidence bases for the effectiveness of behavior analysis for people with IDD and people with dementia, and the strength of small-*N* designs and their suitability to this population (Morgan & Morgan, 2001; Steingrimsdottir & Arntzen, 2015), behavior analysts are well suited to working with people with IDD who develop dementia. The increased prevalence of dementia in people with IDD means that behavior analysts are likely to encounter people with a comorbid diagnosis in their work and will seek guidance from the behavior-analytic literature (1.01 Reliance on Scientific Knowledge; Behavior Analyst Certification Board [BACB], 2016). Although the separate evidence bases (i.e., involving people with IDD and people with dementia) will be of use to

those working with individuals with a comorbid diagnosis, there are unique considerations that must be taken into account with this population. Specifically, clinicians need to be aware of the change of environment when individuals with IDD develop dementia and move from home to residential or day center placements, the difference in provision available for people with IDD in older services compared to disability services, and how impairments can be exacerbated by the aging process for people with IDD (LeBlanc & Matson, 1997).

We are not aware of any reviews of the behavior-analytic literature specifically targeting people with both IDD and dementia, although reviews of the behavior-analytic dementia literature have been conducted (e.g., Buchanan, Husfeldt, Berg, & Houlihan, 2008; Trahan, Kahng, Fisher, & Hausman, 2011). Older adults remain an understudied population (Buchanan et al., 2008), and older adults with IDD are even more understudied. It is possible that the literature for such a specific target population is published outside of core behavior-analytic journals (Burgio & Kowalkowski, 2011), which calls for an analysis of the current evidence base.

We aimed to review the literature on behavior-analytic approaches to increasing, decreasing, or maintaining behaviors in individuals with IDD who had developed or who had suspected dementia, or approaches to changing the behavior of their caregivers. We also aimed to analyze in which journals the research has been published to determine whether a behavior-analytic audience may have been reached. We further manually searched the last 20 years of five major behavior-analytic journals to find articles in which participants were people with IDD and diagnosed or probable dementia. Finally, we analyzed the behavior-analytic research found using the seven dimensions of ABA (Baer et al., 1968; Baer, Wolf, & Risley, 1987) as a framework. We chose this framework in order to evaluate articles published in non-behavior-analytic journals and their contribution to the behavioral literature on people with IDD who develop dementia.

Method

Data Selection

Web of Science and PsycInfo were searched in November 2016 for relevant articles using specific search terms. Web of Science returned 211 articles that matched the search criteria, and PsycInfo returned 459 articles. We also found one study in a different literature search (Sharp, Lucock, Brand, & Cowie, 2018) resulting in a total of 671 articles. Articles were returned if they contained one descriptor of dementia (e.g., "major neurocognitive disorder," "Alzheimer"), the word "behavio*r," and one descriptor of IDD (e.g., "intellectual disability," "Down*s syndrome"). We did not include any date restrictions for this search.

The relevance of each article was determined by reviewing the title and abstract and applying the following exclusion criteria. Excluded *medical* articles were those in which the purpose was to analyze the brain in relation to the characteristics of the population being studied, or to study the presence, effects, or levels of a chemical or drug. Articles excluded based on *population* were those in which the participants were not people with comorbid dementia (including Alzheimer's disease but not including "cognitive decline") and intellectual disabilities (this included terms such as "Down syndrome," "handicapped," "learning disability," etc.), or were nonhumans. Articles in which the behavior of interest was that of caregivers of people with IDD and dementia were included. Articles were excluded if the purpose was to give a *diagnosis* or determine prevalence of diagnoses. Excluded *nonexperimental* articles were those without an experimental research design (i.e., nonempirical case studies were excluded but group designs or single-subject experimental designs were included). Review articles, book chapters, and editorial articles were also excluded. After the exclusion criteria were applied, 57 articles remained, which were reviewed in full. This full review resulting in exclusion of 10 as duplicates, 14 as meeting exclusion criteria, and 4 due to inaccessibility, resulting in a final 30 articles.

Next, the reviewers manually searched every issue of the *Journal of Applied Behavior Analysis*, the *Journal of Experimental Analysis of Behavior*, *Behavior Analysis in Practice*, *Behavioral Interventions*, and the *European Journal of Behavior Analysis* from 1997 to the most recent issue published (as of September 2017). The review included the title and abstract to exclude any article that specified a population other than individuals with ID and/or diagnosed/probable dementia. Next, the method section for remaining articles was reviewed and any articles for which the participants were at least one individual with an intellectual disability (including "mental retardation") aged 30 or over were included.

Data Analysis

For each article included in the data analysis, the following information was extracted: the number of participants, age, gender and diagnosis, the data-collection setting, the target behavior, the purpose of the study (i.e., to increase or decrease behavior), and whether there was a direct measure of behavior (e.g., direct observation) or indirect measure (caregiver ratings or questionnaires). The articles were also coded for report of response generalization or stimulus generalization data, maintenance probes, interobserver agreement for data, and procedural integrity for intervention procedures. Finally, studies were coded as having an experimental design (i.e., a variable was manipulated to determine the effect on behavior) or being descriptive. In total, 15 variables were coded from each of the articles.

The six articles designated as "behavior analytic" were analyzed in relation to the seven dimensions of ABA (Baer et al., 1968, 1987): applied, behavioral, analytic, technological, conceptual systems, effective, and generality. This analysis was conducted by reviewing each article and extracting related information to see whether the article met the criteria for each dimension (Table 1).

Intercoder Agreement

Coder agreement data were collected by a second independent coder on whether each of the articles was included or excluded in the analysis. Randomly selected articles (*n* = 259; 39%) were coded by the second observer for the exclusion criteria. Agreement was calculated for exclusions and inclusions by dividing the number of agreements (i.e., coders both included or both excluded) by the total number of articles evaluated by both coder (259). Agreement was 91%. Articles for which coders disagreed were discussed, and a consensus reached regarding inclusion. A second coder also extracted data on all 15 variables for 14 of the 30 articles (47%). Agreement on a variable occurred when both coders extracted exactly the same information from an article. Agreement was calculated by dividing the total number of agreements across variables and articles by the total number of variables (*n* = 168; 15 variables for each of the 14 articles). Agreement for the data on the variables was 95% (range 86%–100%). Agreement was calculated for the number of articles containing at least one participant with IDD over the age of 30 for 40% of the issues of the *Journal of Applied Behavior Analysis*, the *European Journal of Behavior Analysis, Behavioral Interventions*, and the *Journal of Experimental Analysis of Behavior*, and 100% of the issues of *Behavior Analysis in Practice*. Agreement was calculated by dividing the number of agreements by the total number of articles evaluated by both coders. Intercoder agreement was 97.8% for the *Journal of Applied Behavior Analysis*, 98.9% for *Behavior Analysis in Practice*, 100% for the *European Journal of Behavior Analysis*, 96.5% for *Behavioral Interventions*, and 99.1% for the *Journal of Experimental Analysis of Behavior*.

Results

For the 30 studies included from the Web of Science and PsycInfo search, an article was designated as "behavior analytic" if the primary purpose was to analyze or manipulate environmental variables in relation to operationally defined behaviors. Five articles met the definition of "behavior analytic." The five behavior-analytic articles identified from this

search were published in the *Developmental Disabilities Bulletin*, the *Journal of Applied Research in Intellectual Disabilities, Clinical Case Studies* (two articles), and the *International Journal of Geriatric Psychiatry*. The manual search of the last 20 years of five major behavior-analytic journals identified a total of 176 articles that included at least one participant with IDD aged 30 or older (4.5% of articles reviewed). One article was conducted with an individual with IDD and probable dementia and was published in the *Journal of Applied Behavior Analysis*. Overall, we identified six behavior-analytic articles (see Table 1).

Of the "behavior-analytic" articles, five used direct observation only, and the sixth used informant-based measures, direct testing, and direct observation (Horovitz, Kozlowski, & Matson 2010). Five out of the six studies were experimental (i.e., they measured the change in behavior following an intervention); the sixth used a conditional probability analysis to assess the relationship between behavior and environment events (Millichap et al., 2003). The participants in five articles were diagnosed with Down syndrome and dementia, and in the sixth they were diagnosed with "moderate mental retardation" and probable dementia. The studies included nine females and four males with a mean age of 53.6 years (range 45–63 years). One study took place in a residential treatment center, the second in an alternative-to-employment facility, two in day centers, and the remaining two in group homes. The behaviors of interest were described as running away, well-being, noncompliance, wandering, loitering and stealing, entering or approaching a restricted area, and behavioral excesses such as inappropriate interactions with others and self-talk. The aim of Vogl and Rapp's study (2011) was to decrease wandering and loitering using a differential reinforcement of other behavior procedure, and similarly the aim of Bowman's study (1996) was to decrease running away. In the study by Crook, Adams, Shorten, and Langdon (2016), the aim was to compare the effectiveness of two interventions to increase well-being (measured using dementia care mapping; DCM). The study by Millichap et al. (2003) used a

conditional probability analysis to assess whether behavioral excesses were related to environmental events that preceded and followed behavior. The article by Horovitz et al. (2010) used contingent reinforcement and training to increase compliance with the dressing routine. The purpose of the study by Feliciano, Vore, LeBlanc, and Baker (2004) was to decrease entry to a restricted area using a visual barrier and redirection.

The six articles were authored by 20 authors in total. A search of the BACB, Inc.® certificant registry revealed that of those 20 authors, 6 authors were listed as a Board Certified Behavior Analyst (BCBA) or a Board Certified Behavior Analyst-Doctoral level (BCBA-D). At least one of the authors of four of the six articles was a BCBA or BCBA-D. Only one article met all seven dimensions of ABA (Table 1; Feliciano et al., 2004), and all articles met at least two dimensions. The dimension that was least often met was *analytic* (two articles), and the most commonly met dimension was *technological* (five articles). Four articles were *applied* in that they addressed behaviors of social significance (Bowman, 1996; Feliciano et al., 2004; Horovitz et al., 2010; Vogl & Rapp, 2011). Only three articles were strictly *behavioral* because, although all focused on behavior, three did not specify how the data were collected (Bowman, 1996; Crook et al., 2016; Horovitz et al., 2010); therefore, we cannot be sure that the data-collection methods measured behavior directly or measured subjective reports of behavior (i.e., Bowman, 1996; Crook et al., 2016; Horovitz et al., 2010).

Three of the articles used an AB design; the other three used an ABABCB design (Feliciano et al., 2004), alternating treatments design (Crook et al., 2016), and conditional probability analysis (Millichap et al., 2003). According to the original definition of *analytic* from Baer et al. (1968), only the articles with the alternating treatment design (Crook et al., 2016) and the ABABCB design (Feliciano et al., 2004) met the criteria because they demonstrated a functional relation between the manipulated variables and behavior (Kazdin, 1982). Five articles met the criteria for *technological* because the methods were described in

enough detail for replication. In regard to being *conceptually systematic*, two articles did not explicitly describe or identify the underpinning behavior-analytic concepts (Crook et al., 2016; Horovitz et al., 2010), which again may be due to the requirements of the journal in which they were published. All four articles that included an intervention evaluated the maintenance of the change in behavior after the intervention was withdrawn or programmed for generalization (*generality*). Crook et al. (2016) and Millichap et al. (2003) did not meet criteria for *generality* nor for being *effective*. Millichap et al. (2003) used conditional probabilities to analyze the probability that defined and directly observed behaviors were related to environmental events. As there was no intervention in place, there is no need to judge the effectiveness of this procedure, and similarly, there was no behavior change to be generalized or maintained. Additionally, the definition of an analytic method—"demonstrates convincingly how to make specified behavior changes" (Baer et al., 1987, p. 318)—would not apply to this article as there is no intended change in behavior. However, the article was *conceptually systematic*, *applied*, and *technological*, and therefore could be argued to be behavior analytic.

Discussion

A search of Web of Science, PsycInfo, and five major behavioral journals identified only a small number of behavior-analytic articles that focused on people with IDD and dementia and their caregivers. The vast majority of those articles were published outside of the behavior-analytic literature, but within the IDD literature. An analysis of the dimensions of ABA as defined by Baer et al. (1968, 1987) indicated how well each article met the criteria for behavior-analytic practice and research that have overlapping features (Cooper, Heron, & Heward, 2007). Articles may still be behavior analytic even if some of the dimensions were not evident in them as the requirements of non-behavior-analytic journals may not match these dimensions exactly.

There are at least two potential explanations as to why only six behavior-analytic articles were found; either the search was not comprehensive enough, or these articles constitute the extent of a very small behavior-analytic literature targeting people with IDD who develop dementia. An analysis of the disagreements between coders found that disagreements were specific to the primary purpose of the article and to nonbehavioral articles (i.e., coders disagreed whether the purpose was to determine diagnostic prevalence), and therefore did not affect the review. If the search did not identify all of the published articles, it raises the question of how behavior analysts might find relevant articles. For example, our search did not identify an article by LeBlanc, Geiger, Sautter, and Sidener (2007) in which appropriate speech was increased in people with IDD and dementia or suspected dementia. The article was brought to our attention by the first author after our review. We suspect that there are a number of articles that would meet our criteria that we did not capture. Practitioners may face challenges in accessing the literature (Carr & Briggs, 2010), and accessing relevant articles may be even more difficult if they are not returned in typical searches or if they are published in journals with which behavior analysts may not be familiar. Perhaps the search terms we used did not return relevant articles because behavior-analytic articles are often not focused on diagnoses but rather on behavioral interventions, assessments, or processes, and therefore diagnoses may be underemphasized or not included in an abstract. Similarly, differences in diagnostic labels, such as "cognitive impairment," "cognitive decline," "major neurocognitive disorder," "dementia," "intellectual disability," "developmental disability," and so forth, may make it difficult to identify all relevant articles in a single search. For example, we chose to avoid searching for the term "cognitive impairment" in relation to adults because it returned an unmanageable number of irrelevant articles.

Of the six articles, only one was published in a behavior-analytic journal. For example, Vogl and Rapp (2011) and Horovitz et al. (2010) were both published in *Clinical Case Studies.* Practitioners outside of behavior analysis are more likely to come into contact with literature published in more general journals (Normand, 2014). However, it may be that authors are not intentionally bypassing a behavior-analytic audience to disseminate their work, but that their work does not meet the criteria for publication in behavior-analytic journals because of a lack of interobserver agreement data or other factors that may unfortunately be sacrificed in everyday behavior-analytic practice. Although behavior analysts need to contact wider audiences, it is also important that research is published in behavior analysis–specific outlets to inform practitioners and to encourage more behavior analysts to pursue research and clinical work with underrepresented populations.

If there are indeed only six behavior-analytic articles, it calls in to question why there are so few publications. Perhaps behavior analysts are working clinically with people with IDD who develop dementia but not publishing their work, or they are neither working with or researching with this population (we suggest this is unlikely, particularly in regard to clinical practice). It may be useful to survey behavior analysts to answer these questions. A possible reason for the limited number of studies could be that changes in behavior in adults with IDD are being misattributed to the IDD diagnosis (i.e., diagnostic overshadowing). Because of this possibility, the manual search included all articles in which participants were people with IDD over the age of 30 (n = 176 articles). Though the coders searched for articles that reported recent or sudden changes in behaviors, none were found. Therefore, we echo the recommendation of the Royal College of Psychiatrists (2015) that clinicians working with people with IDD over the age of 30 conduct regular assessments that might identify changes in behavior and level of functioning that could be indicative of onset of dementia that may serve as a setting event (e.g., Oliver, 1999).

Implications for Practice and Research

The work of behavior analysts may be influenced by the services contacted by people with IDD who develop dementia. If people are likely to remain in disability services, we would expect to see behavior analysts working with these clients (Normand & Kohn, 2013). However, if they transfer to dementia services in which behavior analysts may be less likely to work, there may be fewer opportunities for behavior-analytic practice and research. Staff in disability services may require specialist training to cope with the unique challenges presented by their clients who go on to develop dementia. Behavior analysts are in a strong position to provide and support such training (e.g., through behavioral skills training; Parsons, Rollyson, & Reid, 2012). Additionally, early intervention is vital due to the likely early onset of dementia, and well-trained staff and aware behavior analysts are more likely to be able to detect changes in behavior that cannot be accounted for by medication or environmental changes.

For behavior analysts working with people with IDD who develop dementia, there is a significant amount of literature from the fields of IDD and dementia that can be used to inform clinical practice because the function of behavior is more important than diagnosis. For example, studies addressing "wandering" behavior in people with dementia could inform clinical practice involving "wandering" in someone with IDD who develops dementia because the functional assessment procedures used will be synonymous (e.g., Boyle & Adamson, 2017). Similarly, the literature on teaching people with autism to seek help when lost may be adapted for people with dementia (e.g., Taylor, Hughes, Richard, Hoch, & Coello, 2004). The literature regarding training support staff (Parsons et al., 2012), decreasing challenging behavior (Matson & Jang, 2014), increasing functional skills such as tolerating medical procedures (Cavalari, DuBard, Luiselli, & Birtwell, 2013), and reteaching lost skills such as facial recognition (Cowley, Green, & Braunling-McMorrow, 1992) will be

of use to practitioners working with this population. However, people with IDD who develop dementia are a unique population, for whom adaptations and considerations should be made.

Diagnosis-specific Challenges

There are several unique challenges to be considered when working with people with IDD and dementia. First, it could be assumed that most typically developing adults who develop dementia had verbal behavior prior to the onset of dementia, could engage in self-care activities, and engaged in behavior that was generally socially appropriate. A reasonable goal for the behavior analyst working with this population would be to prevent loss of these skills and reteach skills that are lost. However, people with IDD may lack a full verbal repertoire, lack some self-care skills, or have a history of engaging in challenging behavior before the onset of dementia. A person's learning history should be considered when designing an intervention; it is unlikely that the individual could be taught to use vocal verbal behavior if this was never in the individual's behavioral repertoire before the onset of dementia. Similarly, clinicians should be aware of impairments resulting from aging that may serve as establishing operations. For example, challenging behavior during care routines that is escape maintained may occur when a person with vision impairments is touched without warning (e.g., Baker et al., 2006).

Second, preferences for different types of reinforcers may need to be explored for people with IDD and dementia. Edible reinforcers displace leisure activities for people with IDD (e.g., Bojak & Carr, 1999; Deleon, Iwata, & Roscoe, 1997), but the opposite is true for people with dementia (Virués-Ortega, Iwata, Nogales-González, & Frades, 2012). A preference for edibles over tangibles may decrease in people with IDD as dementia progresses, or it may not be affected at all; knowing whether a shift in preference is likely may guide a behavior analyst to conduct more regular preference assessments or even use them as a diagnostic tool. Preferences that become less stable may affect the effectiveness of

the reinforcers used in behavior-change programs. Currently, there is no research on shifting preferences in people with IDD and dementia, and we suggest that this is a useful avenue for further research. One way to do this would be to replicate the study by Raetz et al. (2013) with people with IDD and dementia.

Third, there is emerging evidence that a deterioration in stimulus control occurs in people with dementia (e.g., Gallagher & Keenan, 2009; Money, Kirk, & McNaughton, 1992; Steingrimsdottir & Arntzen, 2011). The possible interaction between overselectivity (as commonly found in people with IDD; Dickson, Deutsch, Wang, & Dube, 2006) and a deterioration in stimulus control would be a beneficial avenue for further investigation specifically with people with IDD and dementia. If stimulus control becomes faulty in people with IDD who develop dementia, behavior analysts may need to reconsider certain interventions that rely on unimpaired stimulus control, or they may need to ensure they consider the salience of stimuli used during interventions. For example, Feliciano et al. (2004) placed wandering in an adult with IDD and probable dementia under stimulus control by increasing the salience of a restricted area using an additional stimulus (visual barrier) that was subsequently faded. Clearly, there is a need to explore basic learning principles as applied to the unique challenges faced by people with IDD who develop dementia.

Fourth, there is a high prevalence of medication prescribed for people with IDD, particularly in regard to managing challenging behavior (Paton et al., 2011). Because there is evidence that medication can affect the functions of behavior, which can result in treatment interference or low rates of responding that are difficult to assess (Cox & Virués-Ortega, 2016), behavior analysts may need to systematically rule out the effects of medication during their assessment. Being aware of population-specific factors, such as increased medication in people with IDD when compared with older adults without IDD, is an important component of an assessment (Drossel & Trahan, 2015).

In summary, our literature search only returned six behavior-analytic articles that specifically involved people with IDD and dementia. Behavior analysts are well equipped to address the unique challenges faced by people with IDD who develop dementia due to using repeated measures, function-based approaches, and an understanding of the behavioral challenges of people with IDD and people with dementia. However, despite the existence of research that can guide behavior analysts working with people with IDD and dementia (i.e., the separate evidence bases), there is a need for more applied and experimental behavior-analytic research exploring how operant behavior is affected in people with IDD who develop dementia.

Compliance With Ethical Standards

Conflict of Interest: Zoe Lucock declares that she has no conflict of interest. Rebecca Sharp declares that she has no conflict of interest. Robert Jones declares that he has no conflict of interest.

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Table 1
Each of the Six "Behavior-Analytic" Articles Analyzed in Terms of the Seven Dimensions of ABA (Baer et al., 1968, 1987)

	Bowman (1996)	Millichap et al. (2003)	Feliciano et al. (2004)	Horovitz et al. (2010)	Vogl & Rapp (2011)	Crook et al. (2016)
Applied	Yes: Participant walked off campus and onto public roads with traffic and the intervention reduced the frequency of the behavior.	Unclear: Purpose was to determine whether there was a functional relationship between social events and behavioral excesses in individuals with Down syndrome and dementia.	Yes: Purpose was to decrease wandering into an area that was restricted due to hazards.	Yes: Target behavior was noncompliance to getting dressed.	Yes: Intervention reduced inappropriate loitering and stealing in day facility the participant attended.	Unclear: Randomized case series design to determine whether rummage boxes or life story books improved well-being. Did not aim to change behavior.
Behavioral	Unclear: No description of the data-collection methods.	Yes: There was direct observation of target behaviors, and the behaviors were operationally defined.	Yes: There was direct observation of target behaviors, and the behaviors of interest were operationally defined.	Unclear: Data collection unclear (e.g., frequency recorded on "standard behavioral report forms" and not stated whether recorded in situ or post hoc). Some description of topography.	Yes: Direct observation data collected on two behaviors, both operationally defined.	Unclear: DCM was the data-collection method and "well-being" was not objectively defined.
Analytic	Unclear: Baseline was brief (one data point showing instances in 1 month), and data for the	Unclear: Used conditional probabilities that demonstrated correlational rather than functional	Yes: An ABABCB design was used, demonstrating a functional relationship between	No: AB design and therefore no clear demonstration of a functional relationship.	No: AB design and therefore no clear demonstration of	Yes: Alternating treatments design.

	withdrawal were anecdotal; therefore, no strong evidence of a functional relationship.	relationships between the target behaviors and environment.	the intervention and decrease in behavior.		a functional relationship.	
Technological	Yes: Methods described in enough detail for replication.	Yes: Methods described in enough detail for replication.	Yes: Methods described in enough detail for replication.	Unclear: Methods partially described, but procedure was changed and changes not described.	Yes: Methods described in enough detail for replication.	Yes: Methods described in enough detail for replication.
Conceptually systematic	Yes: Behavioral principles identified included reinforcers, VI schedules, etc.	Yes: Findings described in relation to possible reinforcers, establishing operations, antecedents, etc.	Yes: Conceptual systems underpinning behavior change discussed.	Unclear: Not explained in behavior-analytic terms (e.g., hypothesized function was “confusion regarding what was expected of him”).	Yes: Behaviors analyzed in terms of hypothesized reinforcers.	No: Underlying behavioral principles not identified.
Effective	Yes: Behavior reduced to zero.	N/A: Conditional probabilities used.	Yes: Decrease in both approaches and entering during intervention.	Yes: Downward trend in intervention phase.	Yes: Reduction in target behavior during intervention phase.	Unclear: No intervention as such. Data showed an intervention was better than none, but that no intervention was better than any other.

Generality	Yes: Behavior reemerged 6 months later (4 months after the intervention).	N/A: Conditional probabilities used.	Yes: Stimulus size faded systematically, and color changed.	Yes: Data reported after 1 month.	Yes: Behavior maintained at 2- and 3-month follow-up probes.	No: No data collected.